

REMARKS

Reconsideration of the present application is requested on the basis of the following particulars.

1. In the Claims

Claim 1 has been amended to include the subject matter of original claims 5 and 8. Claims 5 and 8 are thus canceled without prejudice or disclaimer.

Since the subject matter of claims 5 and 8 have already been examined, it is respectfully submitted that no new issues requiring further detailed consideration or search have been presented by the proposed amendments and that entry of the claim amendments is appropriate under 37 C.F.R. § 1.116. Entry of the amendment at least for purposes of appeal is respectfully requested in view of the fact that they present rejected claims in better form for consideration on appeal (37 C.F.R. 1.116).

2. Rejection of Claim 21 under 35 U.S.C. 112, 2nd paragraph

As shown in the List of Current Claims, claim 21 has been amended to provide proper antecedent basis for the limitation "the circumferential shape." Accordingly, withdrawal of this rejection is requested.

3. Rejection of Claims 1-21 as Being Unpatentable Over U.S. Patent 6,332,029 (Azima et al. '029) or U.S. Patent 6,377,695 (Azima et al. '695) in View of U.S. Patent 3,423,543 (Kompanek)

Claims 1-21 presently stand rejected in view of the disclosures of Azima et al. '029 or Azima et al. '695 combined with the disclosure of Kompanek. This rejection is respectfully traversed on the basis that Azima et al. '029, Azima et al. '695 and Kompanek, whether considered collectively or individually, fail to disclose or suggest the transducer of claim 1 of the present application. Claims 2-21, which depend

directly or indirectly from claim 1, are thus patentable based on their dependency on claim 1, and their individually recited features.

Particularly, as detailed in Applicant's remarks to the Office Action of June 4, 2003, the disclosures of Azima et al. '029 or Azima et al. '695 fail to disclose or suggest the structure and operation of the transducer recited in claim 1. Since the Examiner has not specifically addressed the Applicant's previous remarks due to the new grounds of rejection presented in the outstanding Office Action, Applicant presents again the distinguishing characteristics of the transducer of claim 1 of the present application over the acoustic device described in Azima et al. '029 and Azima et al. '695.

A response to these comments by the Examiner is respectfully requested in the next communication from the Examiner.

Specifically, Azima et al. '029 and Azima et al. '695 each fail to disclose or suggest a transducer comprising a one-piece or multi-piece piezoceramic disk having two radial surfaces and a membrane formed of a material comprising an elastomer which attenuates sound vibrations, wherein one of the radial surfaces of the piezoceramic disk is directly attached to the membrane with a hard glue.

Turning to Azima et al. '029, this reference discloses an acoustic device that operates significantly different than the transducer of the present invention. More particularly, this acoustic device is a "distributed mode" type device in that it generates sound by distributing and bending waves. Of further note, this device excites waves over a significant area and has a diffuse non-directional output. It will be noted that Azima et al. '695 incorporates the teachings of Azima et al. '029 (col. 5, lines 59-65 - in referring to U.S. patent application 08/707,012) and teaches nothing more than installing the acoustic devices of Azima et al. '029 in a specific trim panel described therein.

Contrary to the acoustic device of Azima et al. '029 and '695, the transducer of the present application is a piezoceramic speaker that is near pistonic and the local area is of the excited type with point source coherent radiation characteristics. The pistonic feature of the transducer recited in claim 1 is achieved by the combination of the piezoceramic being attached to the membrane. This combination in the transducer of the present application yields a transducer wherein the piezoceramic and the membrane bend together in one direction at several points therefore forming a directional piston.

The type of transducer disclosed in the present invention is of the type that Azima et al. '695 refers to in distinguishing the acoustic device of Azima et al. '029 over known types of speakers (col. 2, lines 50-55). For example, the disclosure of Azima et al. '695 states that the distributed mode type acoustic device described therein is contrasted to pistonic or local area excited types of acoustic devices that have point source coherent radiation characteristics. Thus, the stark contrast in operation between of the acoustic device of Azima et al. and the transducer of the present invention is readily admitted by Azima et al.

In observing FIG. 13 of Azima et al. '029, it is readily apparent that the construction of the acoustic device of Azima et al. '029 is significantly different from the transducer of amended claim 1 of the present invention.

First, Azima et al. '029 describes the panel (2), which was equated as the membrane in the present application, as being formed of a rigid lightweight laminated sandwich-type panel (col. 24, lines 1-7). In observing FIG. 2b, the panel is has a foam or cellular matrix core (97) that is closed by opposed skins (21) of paper, card plastics, metal foil or a sheet. This panel can hardly be construed as a membrane, as recited in the present application. Instead, it is quite clear from the description in Azima et al. '029 that this panel is a rigid composite structure comprising a plurality of different layers.

Azima et al. '029 describes the panel as being sound radiating (col. 23, lines 28-45), and moreover, the panel is described as being a "multi-mode resonating panel" (col. 20, lines 61-67). On the contrary, the membrane recited in claim 1 is described as being sound attenuating. It is submitted that the contrast between the functional aspects of the panel in Azima et al. '209 and the membrane recited in claim 1 of the present application would be readily to a skilled artisan.

According to the ordinary dictionary meaning of the term "membrane" in the Merriam Webster's Collegiate Dictionary (10th Edition), this term is used to denote "a thin soft pliable sheet or layer." In view of its description by Azima et al. '029, the panel described therein clearly cannot be construed a membrane in its ordinary sense. Moreover, there is nothing to suggest in the disclosure of Azima et al. '029 of providing a membrane formed of a material comprising an elastomer instead of a lightweight rigid panel.

As detailed in the specification of the present application on pages 5-13, materials having a Young's modulus in combination with a low density, as in the rigid and lightweight materials described in Azima et al. '029, have a strong tendency to increase the fundamental frequency of resonance of a transducer. In the transducer of the present invention, use of such materials described by Azima et al. '029 is clearly undesirable.

It should be kept in mind that according to claim 1 of the present application, a preferable embodiment is recited wherein the membrane has sound attenuating properties and thus results in a lower resonance frequency and thus a broader frequency response. A membrane formed of a material comprising an elastomer achieves the desired effect of the present invention.

It is alleged in the Office Action that Azima et al. '029 discloses membranes that are formed according to the specifics provided in claims 2-7 of the present application. However, in view of the description provided in Azima et al. '029 on the

panel, and further in view of the basic definition of the term "membrane," it is submitted that Azima et al. '029 fails to disclose or suggest a membrane formed from such materials recited in claims 2-7.

The Examiner is respectfully requested to identify the location in the disclosure of Azima et al. '029 where the membranes recited in the claims of the present application are disclosed.

In observing FIG. 13, Azima et al. '029 shows a piezo-electric bender 27 that is mounted on a cylindrical block 93 that is connected to a sound radiating panel 2. The cylindrical block 93 is described as being of rigid foam plastic that is fixed in an aperture 20 of the panel 2. In this embodiment, the bender 27 is described as being freely suspended adjacent to a face of the face (col. 32, lines 44-52). Obviously, the piezo bender is not directly attached to the panel. Moreover, a ring of mineral loaded plastic is fixed to the periphery of the piezoelectric bender to add mass thereto.

Turning to FIG. 14, Azima et al. '029 shows another embodiment of the acoustic device described therein. In this embodiment, the piezo bender 27 is mounted along its periphery to the panel 2 such that the piezo bender is freely suspended over a cavity of the panel wherein only the periphery of the bender is in contact with the panel. Alternatively, FIGS. 24 and 47 show different embodiments of the acoustic device of Azima et al. '029, wherein the piezo bender attached onto a larger metal disk 118 which in turn is attached to the panel 2.

As recited in claim 1, the piezoceramic disk is completely attached to the membrane with a hard glue. Since it is known that piezoceramic disks are brittle, completely attaching the piezoceramic disk onto a membrane prevents the breaking of the piezoceramic disk during operation. Contrariwise, in the acoustic devices shown in FIGS. 13, 14 and 15 of Azima et al. '029, a large portion of the piezo bender is not glued to the panel, and extra mass is attached to the piezo bender at

its center or periphery. In this configuration, there is the extant risk that the piezo bender may break during operation or handling.

Nowhere in this reference is there any disclosure or suggestion of attaching an entire radial surface of a piezoceramic disk to a membrane, as recited in claim 1 of the present invention.

As discussed previously, Azima et al. '695 does not disclose an acoustic device different than the device described in Azima et al. '029. In the previous Office Action, it was noted that the radiator 5 is connected to a membrane 1, and thus Azima et al. '695 discloses the present invention. Applicant respectfully disagrees with this interpretation of Azima et al. '695.

First, it will be pointed out that the membrane referred to in the Office Action is actually the roof lining 1 and the radiators 5 are located in the roof lining 1 (col. 5, lines 56-65). Thus, the comparison of the roof lining 1 and the exciter 5 of Azima et al. '695 in the Office Action cannot be construed as the piezoceramic disk and the membrane of the present invention. Therefore, this interpretation is therefore erroneous.

Next, while Azima et al. '695 may disclose a transducer 6 that is mounted on the radiator 5, the transducer 6 is described as being arranged to launch bending waves into the radiator to cause it to resonate to produce an acoustic output (col. 5, lines 61 through col. 6, lines 5). Nowhere in Azima et al. '695 is there any specific teaching that describes the specific construction of the transducer described therein, and thus there is no disclosure or suggestion that recites the transducer of the present invention recited in claim 1. Lastly, Azima et al. '695 repeats throughout its detailed description that the radiator operates as described in Azima et al. '029 (col. 6, lines 4-5 and 26-27), and as discussed above, Azima et al. '029 fails to disclose the transducer of the present invention.

The disclosure of Kompanek fails to overcome the shortcomings of the teachings of Azima et al. '029 and Azima et al. '695. More specifically, Kompanek discloses a loudspeaker having a plurality of piezoelectric wafers distributed on a relatively broad surface defined as a plate. The plate is preferably described as a steel plate, but may be a non-conductor such as plastic or paper with a conductive layer thereon forming the surface (col. 2, lines 29-35). While a plastic plate is described by Kompanek, there is nothing disclosed in this reference that would tend to suggest providing an elastomeric membrane.

As described in the present application, a sound attenuating membrane is provided to attenuate the resonance peaks that occur with known transducers. Moreover, since the piezoceramic disk is glued onto the membrane that has inherent flexible properties over metal membrane known in the prior art, the transducer of the present application provides a construction that has a flat frequency characteristic.

There is no finding as to the specific understanding or principle within the knowledge of the skilled artisan that would have provided the motivation to provide a membrane having sound attenuating properties in the disclosure of Kompanek. Although the prior art device may be capable of being modified to have a transducer with a membrane having sound attenuating properties, there must be some suggestion or motivation in the reference to do so. It is asserted that one of ordinary skill in the art would not be motivated by the disclosure of Kompanek to provide a membrane having sound attenuating properties in a transducer, such as the transducer proposed by Kompanek or in the transducers described in the disclosures of Azima et al. '029, Azima et al. '695.

In summary, Applicant has carefully considered this rejection but it is most respectfully traversed for the reasons discussed above. Accordingly, Applicant respectfully requests reconsideration of the rejection and the withdrawal thereof.

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4. Conclusion

In view of the amendments to the claims, and further in view of the foregoing remarks, it is respectfully submitted that the application is in condition for allowance. Accordingly, it is respectfully requested that claims 1-4, 6, 7 and 9-21 be allowed and the application be passed to issue.

If any issues remain that may be resolved by a telephone or facsimile communication with the Applicant's Attorney, the Examiner is invited to contact the undersigned at the numbers shown below.

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final amendment.wpd

Respectfully submitted,



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